

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (CURRENTLY AMENDED) A detector of liquid consumption condition comprising;

a first vibrating part that can vibrate relatively to a containing space that can be filled and refilled with a liquid, at least a portion of the first vibrating part being exposed to the containing space through a first opening formed in a wall part defining the containing space, the first opening determining an area of the first vibrating part,

a first piezoelectric device that can cause the first vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal ~~by~~-based on a residual vibration of the first vibrating part depending on a liquid consumption condition,

a second vibrating part that can vibrate relatively to the containing space, at least a portion of the second vibrating part being exposed to the containing space through a second opening formed in the wall part defining the containing space, the second opening determining an area of the second vibrating part,

a second piezoelectric device that can cause the second vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal ~~by~~-based on a residual vibration of the second vibrating part depending on the liquid consumption condtion,
and

a liquid consumption condition detecting part that can detect ~~a~~the liquid consumption condition based on the counter electromotive force signal from at least one of the piezoelectric devices,
wherein:

the containing space can contain only a predetermined volume of the liquid,
the first vibrating part and the first piezoelectric device are provided in a vicinity of a liquid surface in the containing space when the containing space contains the predetermined volume of the liquid, and

the second vibrating part and the second piezoelectric device are provided in a vicinity of a liquid surface in the containing space when the liquid is exhausted from the containing space.

2. (WITHDRAWN) A detector of liquid consumption condition comprising;

a vibrating part that can vibrate relatively to a containing space that can be filled and refilled with a liquid, at least a portion of the vibrating part being exposed to the containing space,

a piezoelectric device that can cause the vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal by a vibration of the vibrating part,

a second vibrating part that can vibrate relatively to the containing space, at least a portion of the second vibrating part being exposed to the containing space,

a second piezoelectric device that can cause the second vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal by a vibration of the second vibrating part, and

a liquid consumption condition detecting part that can detect a liquid consumption condition based on the counter electromotive force signal from at least one of the piezoelectric devices,

wherein:

the vibrating part and the piezoelectric device are provided in a vicinity of and higher than a predetermined level in the containing space, and

the second vibrating part and the second piezoelectric device are provided in a vicinity of and lower than the predetermined level in the containing space.

3. (WITHDRAWN) A detector of liquid consumption condition according to claim 2,

wherein:

the vibrating part, the piezoelectric device, the second vibrating part and the second piezoelectric device are formed in one module structure.

4. (CURRENTLY AMENDED) A detector of liquid consumption condition according to claim

1, wherein:

the liquid consumption condition detecting part is adapted to detect the liquid consumption condition based on a relative relationship between the two counter electromotive force signals from the first piezoelectric device and the second piezoelectric device.

5. (CURRENTLY AMENDED) A liquid container comprising;
- a wall part defining a containing space that can contain a liquid in a refillable manner,
 - a first vibrating part that can vibrate relatively to the containing space, at least a portion of the first vibrating part being exposed to the containing space through a first opening formed in the wall part, the first opening determining an area of the first vibrating part,
 - a first piezoelectric device that can cause the first vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal ~~by~~ based on a residual vibration of the first vibrating part depending on a liquid consumption condition,
 - a second vibrating part that can vibrate relatively to the containing space, at least a portion of the second vibrating part being exposed to the containing space through a second opening formed in the wall part, the second opening determining an area of the second vibrating part, and
 - a second piezoelectric device that can cause the second vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal ~~by~~ based on a residual vibration of the second vibrating part depending on the liquid consumption condition,
- wherein:
- the containing space can contain only a predetermined volume of the liquid,
 - the first vibrating part and the first piezoelectric device are provided in a vicinity of a liquid surface in the containing space when the containing space contains the predetermined volume of the liquid, and

the second vibrating part and the second piezoelectric device are provided in a vicinity of a liquid surface in the containing space when the liquid is exhausted from the containing space.

6. (WITHDRAWN) A liquid container comprising;

a wall part defining a containing space that can contain a liquid in a refillable manner,
a vibrating part that can vibrate relatively to the containing space, at least a portion of the vibrating part being exposed to the containing space,

a piezoelectric device that can cause the vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal by a vibration of the vibrating part,

a second vibrating part that can vibrate relatively to the containing space, at least a portion of the second vibrating part being exposed to the containing space, and

a second piezoelectric device that can cause the second vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal by a vibration of the second vibrating part,

wherein:

the vibrating part and the piezoelectric device are provided in a vicinity of and higher than a predetermined level in the containing space, and

the second vibrating part and the second piezoelectric device are provided in a vicinity of and lower than the predetermined level in the containing space.

7. (WITHDRAWN) A method of manufacturing a liquid container a liquid container including:

a wall part defining a containing space that can contain a liquid in a refillable manner,
a vibrating part that can vibrate relatively to the containing space, at least a portion of the vibrating part being exposed to the containing space,

a piezoelectric device that can cause the vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal by a vibration of the vibrating part, and

a liquid consumption condition detecting part that can detect a liquid consumption condition based on the counter electromotive force signal from the piezoelectric device, wherein:

the containing space can contain only a predetermined volume of the liquid,
the vibrating part is provided in a vicinity of a liquid surface in the containing space when the containing space contains the predetermined volume of the liquid, and

the portion of the vibrating part exposed to the containing space has a liquid-philic characteristic with respect to the liquid, comprising;

a liquid-philic-part forming step of structuring the portion of the vibrating part exposed to the containing space as a part having a liquid-philic characteristic with respect to the liquid, and

a mounting step of attaching the liquid consumption condition detecting part to the wall part, after the liquid-philic-part forming step.

8. (WITHDRAWN) A method of manufacturing a liquid container a liquid container including:

a wall part defining a containing space that can contain a liquid in a refillable manner,
a vibrating part that can vibrate relatively to the containing space, at least a portion of the vibrating part being exposed to the containing space,

a piezoelectric device that can cause the vibrating part to vibrate based on a driving signal and that can generate a counter electromotive force signal by a vibration of the vibrating part, and

a liquid consumption condition detecting part that can detect a liquid consumption condition based on the counter electromotive force signal from the piezoelectric device, wherein

the containing space can contain only a predetermined volume of the liquid,
the vibrating part is provided in a vicinity of a liquid surface in the containing space when the containing space contains the predetermined volume of the liquid, and

the portion of the vibrating part exposed to the containing space has a liquid-philic characteristic with respect to the liquid,
comprising;

a mounting step of attaching the liquid consumption condition detecting part to the wall part, and

a liquid-philic-part forming step of providing a liquid-philic characteristic with respect to the liquid for the portion of the vibrating part exposed to the containing space, after the mounting step.

9. (WITHDRAWN) A detector of liquid consumption condition according to claim 2, wherein:

the liquid consumption condition detecting part is adapted to detect the liquid consumption condition based on a relative relationship between the two counter electromotive force signals from the piezoelectric device and the second piezoelectric device.

10. (ORIGINAL) A detector of liquid consumption condition according to claim 1, wherein:

the liquid consumption condition detecting part is adapted to measure a frequency of the counter electromotive force signal.

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11. (ORIGINAL) A detector of liquid consumption condition according to claim 10, wherein:

the liquid consumption condition detecting part has a counter that can count the number of vibrations in the counter electromotive force signal for a predetermined time, and

the liquid consumption condition detecting part is adapted to measure the frequency of the counter electromotive force signal, based on the number counted by the counter.

12. (ORIGINAL) A detector of liquid consumption condition according to claim 10, wherein:

the liquid consumption condition detecting part has a clock-counter that can measure a time for which the counter electromotive force signal vibrates a predetermined number of times, and

the liquid consumption condition detecting part is adapted to measure the frequency of the counter electromotive force signal, based on the time measured by the clock-counter.

13. (WITHDRAWN) A detector of liquid consumption condition according to claim 2, wherein:

the liquid consumption condition detecting part is adapted to measure a frequency of the counter electromotive force signal.

14. (WITHDRAWN) A detector of liquid consumption condition according to claim 13, wherein:

the liquid consumption condition detecting part has a counter that can count the number of vibrations in the counter electromotive force signal for a predetermined time, and

the liquid consumption condition detecting part is adapted to measure the frequency of the counter electromotive force signal, based on the number counted by the counter.

15. (WITHDRAWN) A detector of liquid consumption condition according to claim 13, wherein:

the liquid consumption condition detecting part has a clock-counter that can measure a time for which the counter electromotive force signal vibrates a predetermined number of times, and

the liquid consumption condition detecting part is adapted to measure the frequency of the counter electromotive force signal, based on the time measured by the clock-counter.